

Gamma-gamma directional correlation in ^{200}Hg By Z. GRABOWSKI¹ and B. VAN NOOIJEN²

With 1 figure in the text

ABSTRACT

The spin of the 1885 keV level in ^{200}Hg has been determined by a directional correlation measurement. Using internal conversion data, it is possible to make the following assignments: 4^- to the 1885 keV level, 2^+ to the 1595 keV level and 3^- to the 2137 keV level.

The 27 h ^{200}Tl isotope decays by electron capture and positron emission to ^{200}Hg . This decay has been investigated by several authors [1]. Their results are summarized in the decay scheme shown in fig. 1.

It appeared worth while trying to determine the spin of the 1885 keV level by measuring the 1517–368 keV directional correlation. Knowledge of the spin of the 1885 keV level might enable one to derive more definite conclusions about the spins and parities of some other high lying energy levels from the available internal conversion data [2].

^{200}Tl sources were produced by the synchrocyclotron of the Werner Institute, Uppsala. A solution of TlCl_3 was used for the correlation experiments. The automatic directional correlation equipment is described elsewhere [3]. One of the spectrometers was set to receive the photopeak of the 368 keV gamma ray; the other spectrometer was set to accept the high-energy part of the 1517 keV photopeak in order to avoid a contribution of 1207 and 1227 keV gamma quanta. The result of the measurement was

$$W(\vartheta) = 1 + A_2 P_2(\cos \vartheta) + A_4 P_4(\cos \vartheta),$$

with $A_2 = +(0.101 \pm 0.005)$ and $A_4 = +(0.007 \pm 0.012)$.

As a check on the performance of the apparatus the (1207 + 1227)–368 keV directional correlation was also measured. The result obtained after subtraction of the contribution of the 1517–368 keV cascade was $A_2 = +(0.065 \pm 0.003)$ and $A_4 = +(0.020 \pm 0.007)$, in good agreement with Lindqvist's results [3]. The reasons why the 1517–368 keV contribution does not very much affect Lindqvist's result are the low intensity of this cascade and the fact that both cascades show an almost identical anisotropy pattern.

The result obtained for the 1517–368 keV cascade is in agreement with the following spin assignments to the 1885 keV level: $I = 2$ ($\delta = -0.19$), $I = 3$ ($\delta = -0.25$) and $I = 4$ ($|\delta| \leq 0.01$), where δ denotes the amplitude mixing ratio in the 1517 keV

¹ On leave from "Instytut Badán Jadrowych", Kraków.

² On leave from the "Technische Hogeschool", Delft.

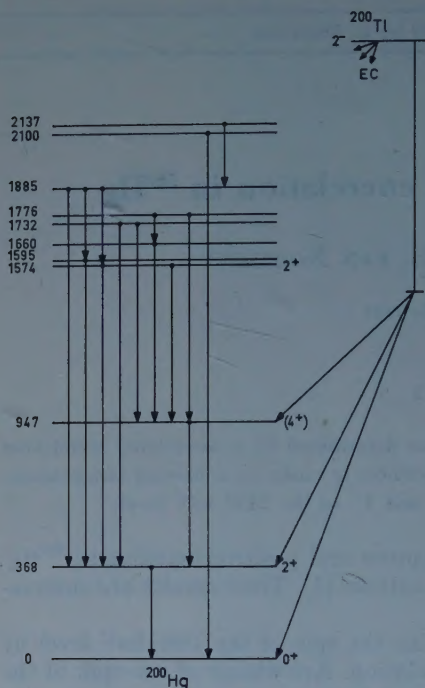


Fig. 1. Decay scheme of ^{200}Tl (ref. 1).

transition. The experimental conversion coefficient for this transition is $(1.0 \pm 0.5) \cdot 10^{-2}$ [2]. Combining this value with the directional correlation result a spin 4 and odd parity should be assigned to the 1885 keV level.

On the basis of the internal conversion data [2] one is now apt to assign 2^+ to the 1595 keV level and 3^- to the 2137 keV level. The latter assignment makes the electron capture to the 2137 keV level allowed. 2^+ assignment to the 1595 keV level does not agree with a 1^- assignment of Segel [4].

ACKNOWLEDGEMENTS

The authors wish to thank Professor Kai Siegbahn for his kind permission to stay at the Institute and for the excellent working conditions. One of us (B.v.N.) has also to thank the Netherlands Organisation for Pure Scientific Research (Z. W. O.) for a grant.

Institute of Physics, Uppsala, Sweden.

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Tryckt den 17 februari 1960

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